III. REMARKS

Claims 1-8 and 10-20 are pending in this application. By this Amendment, claims 1-8 and 11-19 have been amended, and no claims have been canceled herein. Applicants do not acquiesce in the correctness of the rejections, and do not concede that any claim is not patentable over the art cited by the Examiner. The present claim amendments are only for facilitating expeditious prosecution of the claimed subject matter. Applicants respectfully reserve the right to pursue these and other claims in one or more continuation and/or divisional patent applications. Reconsideration in view of the following remarks is respectfully requested.

Rejections under 35 U.S.C. § 112, Second Paragraph

In the Office Action, claims 1-7 and 14-16 are rejected under 35 U.S.C. § 112, second paragraph, as allegedly being indefinite for failing to particularly point out and distinctly claim the subject matter which the application regards as the invention.

With regard to claims 1-7 and 14-16, the Office specifically asserts that it is unclear if the encrypted exons and the decrypted exons are both outputted (claims 1, 14, last four lines). Applicants have amended claims 1 and 14 herein to recite the feature of

> "outputting the electronic version of the nucleotide chain sequence, including <u>both</u> the encrypted sequence of the at least one exon and the unencrypted sequence of the at least one intron, wherein the sequence of the at least one encrypted exon is <u>subsequently</u> decrypted by a secure process to regenerate the nucleotide chain sequence" (claim 1, lines 11-14; and similarly recited in claim 14, lines 8-11 (emphasis added to indicate relevant amendments)).

Applicants submit that these amendments provide improved clarity with respect to what is included in the outputted nucleotide chain sequence. Further, Applicants submit that no new matter is added by this amendment, as this interpretation is supported by the claim language: the claims teach identifying the sequences of the exons and introns in *a nucleotide chain sequence*

(e.g., in claim 1, line 8), followed by "outputting ... *the nucleotide chain sequence*" (*id.*, line 11). The use of the definite article "the" as opposed to the indefinite article "a" preceding "nucleotide chain sequence" in claim 1, line 11 compels the interpretation embodied in the amendment adding the word "both." Support for the addition of "subsequently" may be found in the specification at p. 7, lines 12-17; FIG. 1, item 18; and FIG. 2, item 24 in conjunction with FIG. 3, specifically items 24, 40, 48, and 12.

With regard to claims 2 and 5, the Office asserts that insufficient antecedent basis exists with respect to the feature of the "system for outputting" (claim 2) and "the system for selectively encrypting" (claim 5). With regard to claims 2-7, the Office asserts that the language reciting "the system for" and "a system for" is vague and indefinite. By this Amendment, Applicants have amended claims 2-7 to address these issues. The recitations of "a system for" and "the system for" have been removed from each of the aforementioned claims.

Accordingly, Applicants submit that all grounds of rejection under § 112 have been obviated, and withdrawal of the rejections is respectfully requested.

Rejections under 35 U.S.C. § 103(a)

In the Office Action, claims 1-4, 6-8, 10-12, 14, 15, 17, 18, and 20 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rungsarityotin *et al.* (Wasinee Rungsarityotin *et al.*, *Grid computing and bioinformatics development. A case study on the* Oryza sativa *(rice) genome*, 74 PURE APPL. CHEM. 891-97 (2002) (hereinafter, "Rungsarityotin")) in view of Patten *et al.* (US Pat. 6,531,316 B1, hereinafter, "Patten"), with additional support from the Merriam-Webster online dictionary ("encrypt," "encode," "encipher," and "cipher"); and claims 5, 13, 16, and 19 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Rungsarityotin in view

of Patten and Jorgenson *et al.* (US Pub. No. 2004/0221163 A1, hereinafter, "Jorgenson"), with additional support from the Merriam-Webster online dictionary.

With regard to independent claim 1, Applicants respectfully submit that the combination of Rungsarityotin and Patten, with support from the Merriam-Webster online dictionary, does not teach each and every element of the claimed invention. The rejection is accordingly traversed, although the claim is amended herein to provide improved clarity with regard to the features which distinguish the claims from the cited art.

For example, Applicants submit that Rungsarityotin and Patten do not teach the feature of "outputting the electronic version of the nucleotide chain sequence, including both the encrypted sequence of the at least one exon and the unencrypted sequence of the at least one intron" (claim 1, lines 11-13). In the Office Action, the Office admits that Rungsarityotin fails to teach the feature of "unencrypted introns," and relies on Patten at col. 22, lines 19-22 to teach the same. (Office Action, p. 7.) The cited passage, however, recites, exhaustively:

> The following exemplify some of the different types of preferred
> formats for diversity generation in the context of the present
> invention, including, e.g., certain recombination based diversity
> generation formats. Nucleic acids can be recombined in vitro by
> any of a... (Col. 22, lines 18-22.)

Applicants respectfully submit that the cited passage clearly fails to teach the feature of "unencrypted introns." Additional passages in Patten which discuss the use of introns also fail to teach "unencrypted introns" (as previously presented) or "the unencrypted sequence of the at least one intron" as claimed (claim 1, line 12-13 (as currently amended)); as the recitations of "intron" in the Patten reference include reference to:

"...transcribing the first plurality of split gene sequences to provide a plurality of RNA segments that can include trans-splicing introns..." (col. 4, lines 7-9)

"A 'genetic element' includes a segment of DNA involved in producing a polypeptide chain and/or RNA chain. It can include regions preceding (e.g., leader) and following (e.g., trailer) the coding region in addition to intervening sequences (e.g., introns) between individual coding segments (e.g., exons). Genetic elements can include individual exons, introns, promoters, enhancers, genes, gene clusters, gene families, operons, and the like." (col. 7, lines 55-63)

"As applicable to the present invention, trans-splicing of RNAs can also involve a process in which an intron of one pre-mRNA interacts with an intron of a second pre-mRNA, enhancing the recombination of splice sites between two conventional pre-mRNAs. Puttaraju, M. et al. (1999) 'Spliceosome-Mediated RNA Trans-Splicing as a Tool for Gene Therapy,' Nat. Biotechnol. 17, 246-252." (col. 15, line 65 – col. 16, line 4.)

"In addition, any split gene sequences (e.g., enhancer-linked split gene sequences, etc.), unencrypted nucleic acids that comprise split gene sequences, trans-splicing introns, toxic genetic elements, or the like are optionally modified to improve, e.g., splicing or activity according to any of these techniques or combinations of these techniques." (Col. 22, lines 7-13.)

"Split gene sequences can be designed to ensure that trans-splicing will be accurately targeted. (Citation omitted.) For example, a gene encoding a desired product, e.g., a growth hormone, Bt toxin, etc. can be split, e.g., between two coding subsequences. A first coding subsequence can include a target binding domain that is complementary to a downstream intron (e.g., βhCG6 intron 1) of the second coding subsequence." (Col. 30, lines 24-32.)

Having reviewed the reference in its entirety, of which the above passages are merely representative, Applicants submit that Patten does not teach the feature of outputting the electronic version of the nucleotide chain sequence, including both the encrypted sequence of the at least one exon and the unencrypted sequence of the at least one intron.

Additionally, Applicants submit that "encryption" as contemplated by Patten is wholly inapposite to the "encryption," and therefore to the "unencrypted introns," of the claimed

invention, and accordingly fails to teach or suggest the claimed invention, including the feature

of outputting, in relevant part, "the unencrypted sequence of the at least one intron" (as amended

herein without prejudice).

Although Patten does not specifically define the word "encrypt" in the definitions section

of the 6,531,316 patent (*see* col. 7, line 33 through col. 8, line 42), it is clear from Patten's use of

the term and its derivatives (including encrypted, encryption, unencrypt, unencrypted, etc.) (*see*

col. 7, line 43 *et seq.* (definition of "unencrypted RNA")), that Patten uses the term to refer to the

"encryption" of phenotypic traits in an organism's genotype. Specifically, Patten's teachings

include splitting gene sequences between two parental organisms, followed by mating those two

parental organisms, and expressing the split gene sequences, creating expression products that

can then be trans-spliced together at the RNA or polypeptide level to provide, e.g., mature

mRNAs or full-length proteins. (*Id.*, lines 26-33.) Patten also teaches methods of unencrypting

trait encrypted gene sequences, such as cDNAs, to provide unencrypted RNAs or polypeptides,

such as full-length proteins. The process may alternatively involve splitting genes between a

host organism and a vector; and unencrypting the gene sequences when the vector invects the

host organism by trans-splicing either the split RNAs or split polypeptides upon expression of

the split gene sequences (Patten, Abstract; *see also* col. 1, lines 33-49; col. 4, lines 1-5).

As taught by Patten, "an 'unencrypted RNA' is an RNA generated by trans-splicing at

least two RNA segments together" (Patten, col. 7, lines 44-45). "Traits are encrypted using 'split

gene sequences'," which are "subsequences of a genetic element." (*Id.*, lines 49-50). Genetic

elements can include, *inter alia*, individual exons and introns, as well as promoters, enhancers,

genes, gene clusters, gene families, operons, etc.. (*Id.*, lines 53-63.) Therefore, Patten's

"encryption" refers to "encryption" of traits in individual exons, introns, genes, gene clusters,

promoters, etc. -- actual, physical nucleic acid molecules. These traits may then be assessed, combined, manipulated, etc., e.g., by plant breeders seeking to include certain toxic genetic elements to provide commercial advantages with respect to hybrid plants (*id.*, lines 36-40), such as improved protection from insect attack (col. 10, line 37).

In contrast, "encryption," as used in the claim language of the instant application, contemplates "securing an electronic version of a nucleotide chain sequence" (claim 1, lines 1-2), including "selectively encrypting the sequence of only the at least one exon identified in the nucleotide chain to provide security over a network" (*id.*, lines 9-10), and "outputting the electronic version of the nucleotide chain sequence, including both the encrypted sequence of the at least one exon and the unencrypted sequence of the at least one intron" (*id.*, lines 11-13). In view of not only the language of the claims, but also the specification, it is unclear how the combination of Patten, including the gene sequence features described above, and Rungsarityotin, which is admitted not to teach the feature of unencrypted introns, render the same obvious. Ordinary skill in the art practiced by Patten, i.e., genetics and genetic engineering, differs entirely from the scope and content of ordinary skill in the art in the field of the claimed invention, i.e., information technology and data security. Even if, *arguendo*, the combination of cited references taught each feature of claim 1, it is completely untenable to assert that one of ordinary skill in the field of the claimed invention would be motivated to "modify the method, system, and program products of Rungsarityotin et al. by using encrypted and unencrypted sequences as described by Patten et al" (Office Action, p. 7), described in greater detail *infra*, "to integrate and exchange information on a particular gene from different international collaborative databases in a careful, but robust manner" (*id.*).

Applicants further submit that the cited references fail to teach the feature of "outputting ... wherein the encrypted sequence of the at least one exon is subsequently decrypted by a secure process to regenerate the nucleotide chain sequence" (claim 1, lines 11-14). In the Office Action, the Office relies on Patten at col. 23, 3rd and 4th paragraphs, to allegedly teach this feature. This passage, however, merely teaches one of "several different general classes of sequence modification methods, such as mutation, recombination, etc." (col. 21, lines 66-67), a list which also includes in vitro recombination of nucleic acids (col. 22, line 22 *et seq.*); recursive recombination of nucleic acids in vivo (col. 22, line 39 *et seq.*); whole genome recombination methods in which whole genomes of cells or other organisms are combined (col. 22, line 51 *et seq.*); synthetic recombination methods, in which oligonucleotides corresponding to targets of interest are synthesized and reassembled in PCR or ligation reactions (col. 23, line 4 *et seq.*). The cited in silico methods of recombination, in which genetic algorithms are used to recombine sequence strings which correspond to homologous and non-homologous nucleic acids, resulting in recombined strings, resulting in random, partially random, or designed variants (col. 23, line 32 *et seq.*). Notably, all of the aforementioned methods, including the cited method, result in the generation of a *recombined* sequence string. As is well known in the art, recombination is a process by which a strand of DNA or RNA is broken and subsequently joined to a different DNA molecule, frequently occurring during eukaryotic meiosis as chromosomal crossover between paired chromosomes. The result is offspring having combinations of genes which differ from both parents. Accordingly, recombination, as it is understood in the art and taught by Patten, does not teach or suggest the feature of "outputting ... wherein the encrypted sequence of the at least one exon is subsequently decrypted by a secure process to regenerate the nucleotide chain sequence" (claim 1, lines 11-14), as antecedent basis requires that the regenerated nucleotide

chain sequence is the same nucleotide chain sequence in which the identifying (claim 1, lines 8-9) first occurred.

On the basis of at least the amendments contained herein and the above remarks, Applicants submit that the combination of Patten and Rungsarityotin, with support from Merriam Webster, do not teach each and every feature recited herein. In view of the above-noted deficiencies, Applicants respectfully request withdrawal of the rejection under § 103(a).

With respect to the rejections of independent claims 8, 14, and 17 under § 103(a), Applicants note that each claim includes features similar in scope to those already addressed above with respect to claim 1, and has been amended analogously herein. Further, the Office relies on the same arguments and interpretations of Rungsarityotin, Patten, and the Merriam-Webster Online Dictionary as discussed above with respect to claim 1. To this extent, Applicants herein incorporate the arguments presented above with respect to claim 1, and respectfully request withdrawal of the rejections of claims 8, 14, and 17 for the above-stated reasons. Accordingly, Applicants respectfully request that the rejections to independent claims 1, 8, 14, and 17 be withdrawn.

With respect to claims 2-7, 10-13, 15-16, and 18-20, Applicants respectfully submit that these claims are allowable for reasons stated above relative to independent claims 1, 8, 14, and 17, as well as for their own additional claimed subject matter. With further respect to claims 5, 13, 16, and 19, Applicants assert that because the Office relies on Jorgenson strictly for its disclosure of securing transmitting data using an encryption scheme including cipher block chaining, the Jorgenson reference does not overcome the deficiencies in Rungsarityotin. Accordingly, Applicants respectfully request that the Office withdraw the rejections under 35 U.S.C. § 103(a) to claims 2-7, 10-13, 15-16, and 18-20.

IV. CONCLUSION

Applicants respectfully submit that the Application as presented is in condition for allowance. Should the Examiner believe that anything further is necessary in order to place the application in better condition for allowance, the Examiner is requested to contact Applicants' undersigned attorney at the telephone number listed below.

Respectfully submitted,

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